DETERMINING THE CAPACITY OF VARIABLES

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AN OLD handbook formula which may be miliar to some of you, would be helpful to l of you if you're trying to determine the lue of a variable capacitor without the aid a grid-dip meter. This method is by far eaper, perhaps simpler, and I would almost nture to say somewhat quicker than a grid-p meter once you have learned how to use Here's the formula straight from the hand-ook:

$$C=0.224\frac{KA}{d}(n\text{-}1)$$

Now let's take a closer look at this formula nd see what each of the letter symbols repre-nts before we actually proceed with any lculations.

(1) C is the symbol representing the ca-acitance we're trying to find, and it has a umerical value expressed in mmf.

(2) 0.224 is a constant which will always emain the same regardless of how many apacitances we calculate. Its value has been etermined by experimentation.

(3) K is the symbol for the dielectric con-tant of the capacitor and is dependent upon he material between the plates of our capaci-or. Variables which have air between the lates have a dielectric constant equal to 1.

(4) A represents the area of one side of ne plate in the capacitor.

(5) d is the symbol for the distance be-ween the plates of the capacitor and must be xpressed in decimals of an inch.

(6) n is the number of plates in the capaci-or, and the quantity $(n\text{-}1)$ means that you must subtract from n the quantity 1.

Typical Example

As an example let's take the capacitor shown in fig. 1. Notice that the capacitor is shown as you would see it if looking directly at one side of it. Now count the number of plates in both sections of the capacitor (the plates that rotate and the plates that are stationary). If you counted 17 plates, then you are correct. You may now replace the n in the formula with the number 17.

The next easiest step would be to measure the distance between the plates. Distance d as shown in fig. 1 measures 0.125 inches. Now replace d with 0.125.

There remains only one symbol for which we have no numerical value, "A". Notice that in fig. 2 the plates take the form of a semi-circle; therefore, we must find the area of a semi-circle by using the formula $A=1.57\ r^2$. Measurement r is the radius of the semi-circle and we can determine this with our ruler. Be sure and measure from the center of the rotatable shaft to the outside edge of the smallest plate. In this example the radius was equal to 1.25 inches Since r^2 means the same as multiplying r by r, we get $r^2=1.56$. If we multiply the 1.57 in our area formula by 1.56 we get the area of the plate, or 2.45.

We now have numerical values for all symbols in the formula with the exception of C. Put them all together and you should have the following:

By multiplying and then dividing correctly,

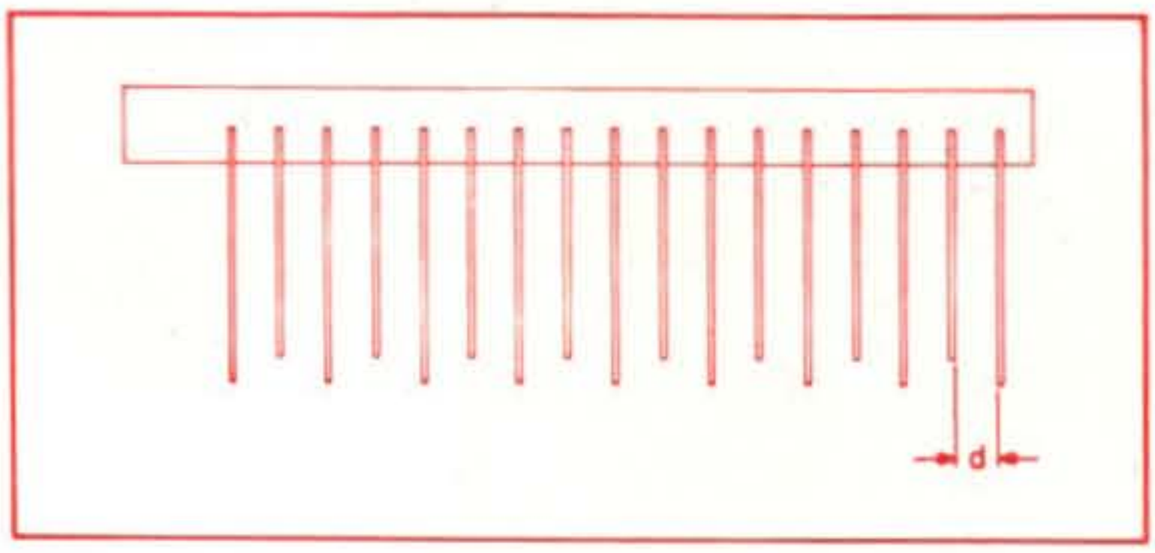

Fig. 1—Partial side view of a variable capacitor showing the rotor (shorter plates) and stator plates. Distance d is the measurement between a rotor and stator plate.

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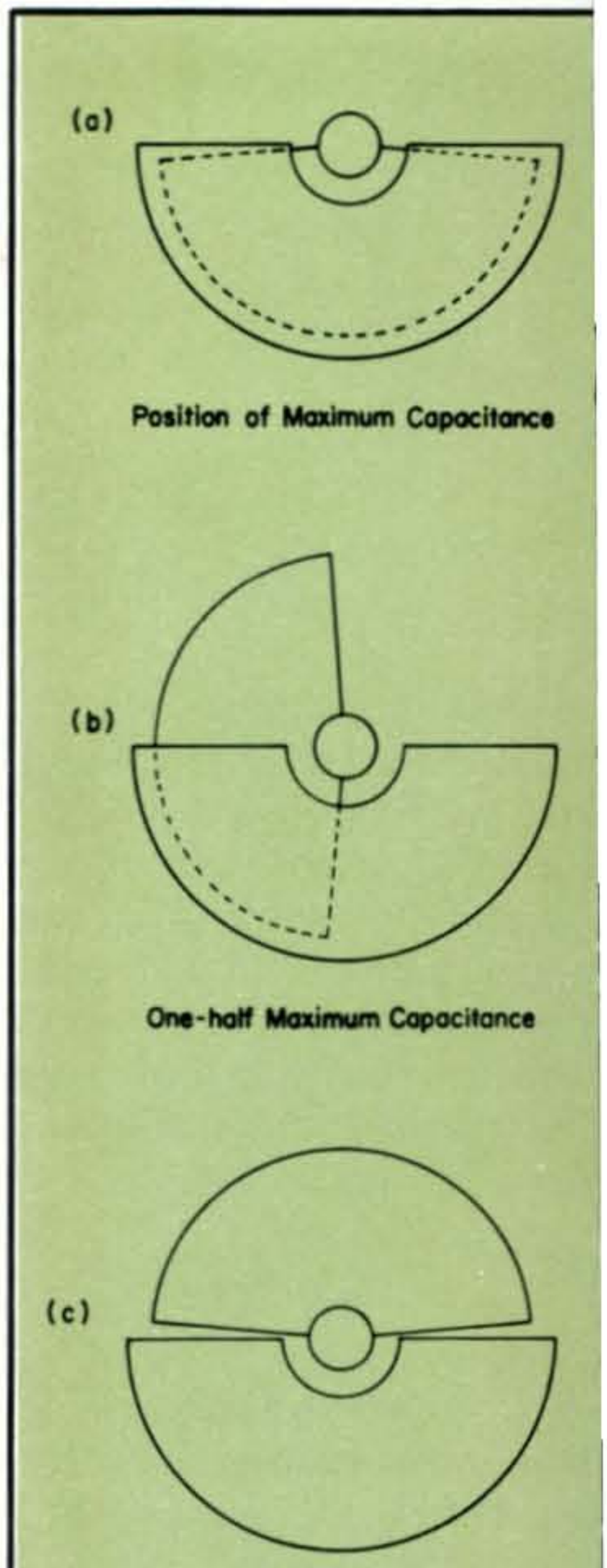
Fig. 2—End view of one pair of plates shows the various positions for *(a)* maximum capacity, *(b)* one-half maximum and *(c)* minimum capacity.



we find that $C = 70$ mmf. This is the maximum value of our capacitor.

Minimum Capacity

Notice that we used only the radius of the smallest plate in figuring the area. This is because the capacitance is dependent upon several factors one of which is the area common to both the rotatable and stationary plates. Refer to fig. 2 which shows several "end" views of a capacitor. In (*a*) we have shown the capacitor in the "meshed" position, maximum capacitance when all the plates are together. In (*b*) only half the rotatable plates are still inside the bottom plates. This results in only half of the maximum capacitance developed in (*a*). If we turn the shaft still more until the plates are in position (*c*), we have minimum capacitance. Since in (*c*) there is no area common to both sets of plates you might think that there should be no capacitance, Strangely enough capacitance is there. This is because when two metal surfaces are placed close to one another there will be *some* capacitance.

Generally speaking, capacitors of the straight-line type which have a maximum capacitance between 50 and 500 mmf will have a minimum capacitance between 15 and 45 mmf, respectively. (Incidentally, our capacitor which had a maximum of 70 mmf has a minimum of 15 mmf.)

For those of you who don't own a grid-dip meter, can't borrow one, and can't steal one, shake the rust off those brains and wipe the cobwebs off those surplus variables. (If you've got one with a manufacturer's number on it, forget what you're just read.) ■

This group photo was taken at the 20th Anniversary Banquet of the Quarter Century Wireless Association on Oct. 27, 1967. More than 200 members, XYLs, and friends attended. At the rostrum are, left to right: Fred Huff, W2AMB, George Bailey, W2KH, Frank Gunther, W2ALS, Earl Thomas, W2MM, Clarence Seid, W2KW, Gus Giranda, W2JE, Dave Talley, W2PF, and John DiBlasi, W2FX. Engraved steel placques were distributed to about 40 of the charter members who were present.

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